9.22

X-rays from Colliding Stellar Winds

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A stellar wind from a massive OB or Wolf-Rayet star in a binary system will strike the surface or stellar wind of its companion, forming shocked gas that can radiate X-rays. The X-ray spectrum from the shocked winds will vary in a predictable way with orbital phase, owing to photoelectric absorption by the stellar winds. We calculate detailed models for the hydrodynamics and X-ray emission from two such systems. In one of these systems (HD165052), the winds are nearly identical in strength. In the other (V444 Cygni) the wind of the Wolf-Rayet star overwhelms and collapses that of its companion. We compare the predicted and observed X-ray luminosity and spectra for these systems, we describe how our results can be scaled to other such systems, and we discuss prospects for future observations.

Session 10: Young Stars, Outflows, and HH Objects

10.17

New Optical Features in L1551 and HH30

J.A. Graham (CIW-DTM) and Mark H. Heyer (U. Penn.)

During a survey for faint H-alpha emission-line stars in Taurus, a pair of on-line, off-line frames of the L1551 - HH30 - HL Tau region was obtained with an 800 by 800 TI CCD detector mounted on the Burrell Schmidt telescope at Kitt Peak National Observatory. Despite several detailed investigations of the field, some potentially important optical features appear to have passed unnoticed.

In L1551 we find a cluster of HH objects W of HH28 which on the average are larger and more diffuse than those closer to the source IRS5. We suggest that these may be associated with an outburst which occurred even earlier than the events proposed by Stocke et al. (Ap.J.Suppl. 68, 229). In the SW and NE corners of the 20' field, we find new outlying HH objects. Radial velocities are still not known but, in their absence, available evidence favors association with the second IR source in the L1551 area, L1551NE (Emerson et al. Ap.J. 278, L49). Excess H-alpha emission is also found in the cavity NE of L1551NE.

In HH30, we can trace the counterjet out to 3', PA 214° from the source making it even longer than the main jet imaged by Mundt et al. (Ap.J. 333, L69). It bends slightly to the N. The counterjet is very faint, possibly because of obscuration by dust in the L1551 cloud itself. Other recognized jets near HL Tau which are also strong in H-alpha can be seen but at lower spatial resolution than before.

10.18

HIGH RESOLUTION MAPPING OF MOLECULAR HYDROGEN IN THE REGION NEAR NCG 7538 (IRS1 & IRS2)

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Previous radio and broad-band infrared studies have indicated the presence of collimated outflows and circumstellar disks around young stellar objects in the star forming region near NGC 7538 (see e.g. Campbell and Persson 1988, AJ 96, 1185 and references therein). In an attempt to better understand the structure and energetics of protostellar environments, we have undertaken a program of long-slit infrared spectroscopy with the KPNO CRSP spectrometer. We observed the region near NGC 7538 IRS1 and IRS2 in the emission lines of molecular hydrogen (1-0, Q1-Q5) near 2.4 microns. We mapped this area with a pixel size of approximately 2.7 arcseconds (about 7560 AU at the distance of the source) with a spectral resolution of about 0.0014 microns. Temperature and density profiles, as well as the spatial distribution of the dust-to-gas ratio will be presented.

*now at McDonald Observatory

Session 11: Molecular Clouds and Star Formation

11.20

Protostellar Candidates in a Sample of Bright Far-Infrared IRAS Sources

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CO and continuum observations have been made in the direction of 39 bright 100μm sources from the IRAS point source catalogue, in an attempt to detect protostars at different evolutionary stages.

CO J=1-0 observations were made with the NRAO 12-m (some J=2-1 observations were made at the JCMT) and for the various sources range in completeness from a five point grid to fully sampled. Central positions were observed in all three isotopes. 12CO observations reveal generally high temperatures (half the objects have T_R^*=15-40K), and wide wings (up to 34km/s). Six cm. continuum observations made with the VLA C-array give a range of results from no detectable continuum (<500 μJy) to well developed HII regions. The CO and IR data may be used to identify sites of protostellar activity and the continuum results may be indicative of an evolutionary sequence.

11.21

Detection of Submillimeter Water Masers near 321 GHz toward Star – Forming Regions and a Late – Type Star

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We report the first astronomical detection of the $10_{29} \rightarrow 9_{36}$ transition of water vapor (H_2O) at a frequency near 321 GHz. Using the Caltech Submillimeter Observatory we detected the line toward the star forming regions W3(OH), W49 N, W51 IRS2, and W51 Main, and the supergiant star VY CMa. In all cases probably maser action is observed. Since the 10_{29} level of H_2O is at an energy of 1861 K above the ground state, the $10_{29} \rightarrow 9_{36}$ line probes very hot molecular material. The $10_{29} \rightarrow 9_{36}$ emission is found at velocities that are near the systemic velocities of the regions studied. The strongest features in spectra of the well-studied 22 GHz $6_{16} \rightarrow 5_{23}$ transition are generally found at similar velocities. Our $10_{29} \rightarrow 9_{36}$ spectra do not show counterparts to the high velocity features observed in the 22 GHz line, but this may be due to the limited sensitivity of our observations.